

## Submento-tracheal intubation

Patients with maxillofacial injuries demand specific considerations for securing airway. In patients with panfacial trauma, surgical reconstruction often involves intraoperative maxillo-mandibular fixation to restore dental occlusion and it is the important aspect of surgical procedure. When maxillo-mandibular fixation has been performed, orotracheal intubation is not feasible and nasotracheal intubation may be indicated. Nasotracheal intubation may not be possible in 10-15% patients due to associated skull base fractures, cerebrospinal fluid rhinorrhea, fractures of nasal skeleton and anatomical obstruction of nasal airway (deviated nasal septum, nasal spur, and hypertrophied nasal turbinates). The presence of a nasotracheal tube can also interfere with the surgical reconstruction of naso-orbital-ethmoid complex.<sup>[1-3]</sup>

Submentotracheal intubation has been described as an alternative to tracheostomy to secure the airway in patients where nasotracheal intubation is contraindicated.<sup>[4-7]</sup>

Although first described in 1986,<sup>[4]</sup> most work on the technique was done in the last decade.<sup>[8-14]</sup> The first case report and case series from India on submentotracheal intubation were published by Malhotra *et al.*<sup>[10,12]</sup> In this issue of the journal, Das *et al.* review the journey of submental intubation in the last 25 years.<sup>[15]</sup>

Altamir described used this technique in a case of panfacial trauma and termed it as 'submental route for endotracheal intubation'<sup>[4]</sup> others called it as 'submental approach to oroendotracheal intubation'<sup>[5]</sup> and 'submental intubation'.<sup>[9]</sup> 'Submentotracheal Intubation' appears to be a precise and clear expression of this procedure.

The indications of submentotracheal intubation are: cranio-maxillofacial trauma, transfacial excision of tumors of base of skull, facial reconstructive surgery, combined cranio-maxillofacial surgery and rhinoplasty, tumors of maxilla and patient's refusal to have tracheostomy. Submento-tracheal intubation has been done in a patient for transfacial excision

of clival chordoma.<sup>[13]</sup> The transfacial approach involves Le Fort I maxillary osteotomy which provides satisfactory surgical exposure to under surface of the anterior midline skull base.

Patients with maxillofacial injuries can have swelling of face, missing or loose teeth, pain and trismus limiting the mouth opening or a maxillo-mandibular fixation may be in situ. Thorough evaluation of the airway and radiographs should be done, including the antero-posterior and lateral views of neck. Neurological evaluation is necessary in patients with coexisting head injury. Submento-tracheal intubation should not be done in patients requiring long-term ventilation. The electrolyte status must be assessed because patients may have a limited oral intake (usually liquids).<sup>[16]</sup>

Maxillo-mandibular fixation is done with high tensile strength elastic bands or classical wires. The maxillo-mandibular fixation can be removed just before induction of anesthesia. It can be redone intra-operatively after securing the airway and subsequently removed at the end of surgery for tracheal extubation. The maxillo-mandibular fixation can again be put in situ in the ward once patient is fully conscious and airway edema has subsided.<sup>[10,12,16]</sup>

The different techniques of submento-tracheal intubation are: lateral approach, midline approach, two-tube technique and use of 'sleeve device'. In the lateral approach, orotracheal intubation with a reinforced tracheal tube is done using standard general anesthesia technique. A 1.5-2-cm incision is made in the submental region parallel and medial to the inferior border of the mandible and lateral to the anterior belly of digastric muscle. The right side is preferred because it allows better visualization of the intraoral position of tracheal tube with direct laryngoscopy. The incision is extended intraorally by blunt dissection with artery forceps through the subcutaneous layers, mylohyoid muscle, submucosa and mucosa. The intraoral opening is lateral to the submandibular and sublingual ducts. A 'submental tunnel' is thus created. The tracheal tube is briefly disconnected from the breathing circuit and the tube connector detached, the pilot balloon followed by the tracheal tube is gently pulled out through the submental tunnel. During this, the endotracheal tube is stabilized intraorally manually or by Magill's forceps. The tube connector is reattached and tracheal tube is connected to the breathing circuit and bilateral air entry is checked. The marking on the endotracheal tube at the skin exit point is noted (usually 2 cm more than the oral fixation) and the tube fixed

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with suture. Intraorally, the tracheal tube lies in the sublingual sulcus between the tongue and mandible and is away from the surgical field. The procedure is usually completed within 5-10 minutes and the blood loss is minimal. At the end of surgical procedure, submento-tracheal intubation is converted back to orotracheal intubation. The reinforced tube can be pulled out through the submental tunnel also. The submental incision is closed with interrupted skin sutures while the intraoral incision heals secondarily.<sup>[4,10,12]</sup>

**Perioperative Care:** Antibiotic cover is provided as per institutional protocol. Oral hygiene is maintained with 0.2% chlorhexidine mouthwash four times per day. The submental incision allows certain degree of drainage and helps prevent infectious complications. Antiseptic dressing is done and sutures are removed on the sixth postoperative day. The scar is almost invisible after 2 months.<sup>[10,12]</sup>

The proposed advantages of 'midline approach' over lateral approach are decreased bleeding, less incidence of sublingual glands involvement and easy tracheal tube passage. However, lateral approach is the most commonly used as it is technically easy.<sup>[7]</sup>

In the 'two-tube technique', airway is first secured with conventionally placed orotracheal tube. The submental incision and the rest of the dissection are same as that in the lateral approach. The second tracheal tube (reinforced) is then drawn into the mouth through the submental tunnel. The first tube is now withdrawn under direct laryngoscopy and the second tube substituted. The two-tube technique of submento-tracheal intubation is useful when the removal of tracheal tube connector is difficult and there is less risk of compromising the airway. However, grasping and drawing in the tracheal end of endotracheal tube can damage the tube cuff.<sup>[6]</sup> While using the two-tube technique, securing airway tube under direct laryngoscopy with Magill's forceps is not easy, especially in patients with panfacial trauma as facial and oral edema making direct laryngoscopy difficult.

Left-sided submento-tracheal tube placement is more difficult as a left molar approach of laryngoscopy is required. To overcome this problem, the use of tracheal tube exchanger in the two-tube technique is advocated.<sup>[14]</sup> The tracheal tube exchanger is introduced into the orotracheal tube and the submento-tracheal tube is drawn into the mouth. The orotracheal is removed over the tracheal tube exchanger and the proximal end of tracheal tube exchanger is introduced into the submento-tracheal tube and brought out from its machine end. The tube is now threaded over the exchanger into the trachea. Tracheal tube exchanger has also been used for replacing the damaged submento-tracheal tube.<sup>[17]</sup>

A 'sleeve device' can be used to prevent the detachment of pilot balloon of the reinforced tube from inflation tube while pulling the tube through submental tunnel.<sup>[11]</sup> The 'Sleeve Device' is obtained by cutting a 10-cm long piece from the proximal end of a 10-mm ID tracheal tube and slitting it along its length. The pilot balloon and inflation tubing are enclosed in this sleeve device and pulled out through the tunnel by holding the sleeve and not the pilot balloon. At the end of surgery the sleeve, enclosing the pilot balloon and the tracheal tube are pulled into the oral cavity. This reduces the chances of damage to pilot balloon and disconnection of inflation tubing from the pilot balloon.

The submento-tracheal tube has been left in situ for up to 3 days. Mechanical ventilation can be instituted through it in the intensive care unit. Tracheal suction with a lubricated catheter can be easily done through it. Reinforced tracheal tubes have the advantage of a low pressure, high volume tracheal tube cuff. When the submento-tracheal tube is not removed, it is mandatory that access to oral airway be ensured. Maxillo-mandibular fixation should be deferred till tracheal extubation and confirmation of secure airway. If maxillo-mandibular fixation is necessary then cutter should be immediately available. If reinforced tube is removed outside the operating room, closure of submental incision is done under local anesthesia.<sup>[10,12]</sup>

Submento-tracheal intubation provides a secure airway, unobstructed intraoral surgical field, allows maxillo-mandibular fixation and avoids complications of tracheostomy. It is a simple, safe and useful technique with low morbidity. It is contraindicated in patients requiring long-term airway support and maintenance, patients with multisystem trauma and severe neurological deficit, known severe keloid formers, maxillofacial gunshot injuries and in maxillofacial tumor ablation.<sup>[10,12]</sup>

Adverse events associated with the technique are superficial infection, orocutaneous fistula, bleeding, pilot balloon damage and disconnection of inflation tubing from the pilot balloon, submandibular duct/sublingual gland or duct/facial nerve/lingual nerve trauma and hypertrophic scar.<sup>[4,10,12]</sup>

The clinical pearls for an uneventful and successful submento-tracheal intubation<sup>[4,10-14]</sup> are : In case of difficulty in bringing out the tracheal tube through the submental tunnel, do adequate blunt dissection through the mylohyoid muscle; to prevent difficulty in removing the tracheal tube connector or reattaching it, loosen the tube connector before oral intubation; if manufacturer's design prevents the removal of the tracheal tube connector, follow two-tube technique; prevent accidental tracheal extubation while taking the tube out through the submental tunnel by securing the tracheal tube in the mouth

either manually or by Magill's forceps; use a 'Sleeve device' to prevent damage to pilot balloon and disconnection of inflation tubing from the pilot balloon; administer 100% oxygen during its placement to prevent hypoxia; avoid trauma to submandibular duct, sublingual gland or duct, facial nerve or lingual nerve by doing blunt dissection as close as possible to the inner aspect of mandible; avoid infection of the wound and orocutaneous fistula by ensuring a not so tight closure of submental incision, maintaining oral hygiene and asepsis; decrease scarring by short-term use of submental intubation.

## Retromolar Intubation

Retromolar intubation is a noninvasive technique of securing airway in patients with panfacial trauma and avoids both submento-tracheal intubation and tracheostomy in majority of patients. Successful use of this technique has been reported in 15 patients with panfacial trauma where orotracheal intubation was not feasible and nasotracheal intubation contraindicated.<sup>[18]</sup>

In this technique, initially orotracheal intubation is done with a flexometallic tracheal tube. The orotracheal tube is then placed in the retromolar space i.e., space behind the last upper and lower erupted molar teeth. The retromolar tracheal tube is then fixed by a wire ligature to the molar/premolar tooth along the upper or lower maxilla in a "figure of eight" fashion. Overzealous fixation of the tube by wire ligature should be avoided because it can deform the tube. Intraoperative intermaxillary fixation can be easily done. At the end of surgical procedure, wire ligature is cut, ensuring adequate mouth opening, and the tube again brought back intraoral. Trachea is extubated by the standard method later.<sup>[19]</sup>

Adequacy of retromolar space can be determined by introducing the index finger in the patient's mouth and asking him or her to close the mouth. No compression on the finger means fairly adequate retromolar space. If the space is inadequate, a tracheal tube could not be placed there. Retromolar space can be enhanced by extraction of the third molar tooth followed by a semi-lunar osteotomy.<sup>[20]</sup> Osteotomy and tooth extraction renders this technique impractical. The success of retromolar intubation can be increased by using a smaller tracheal tube. A disadvantage of retromolar intubation is that the tube can interfere with the surgical field and with the positioning and application of dental fixation devices.

Airway management in patients with cranio-maxillofacial trauma is a challenge for both anesthesiologist and surgeon and requires close interaction between them. Retromolar

intubation is a simple, easy and noninvasive technique of tracheal intubation when oral intubation is not feasible and nasotracheal intubation is contraindicated. When retromolar intubation is not possible, submento-tracheal intubation is a relatively harmless alternative to tracheostomy for securing the airway.

**Naveen Malhotra**

Naveen Niketan, 128/19, Doctors Lane, Near Civil Hospital,  
Rohtak-124001 (Haryana)  
E-mail: drnaveenmalhotra@yahoo.co.in,

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